## *Interactive comment on* "Atmospheric reactive nitrogen concentrations at ten sites with contrasting land use in an arid region of Central Asia" *by* K. H. Li et al.

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General Comments: This manuscript, "Atmospheric reactive nitrogen concentrations at ten sites with contrasting land use in an arid region of Central Asia", is a good baseline assessment of the concentrations of nitrogenous species for an understudied region of the world, the arid Xinjiang region of China. This study will provide foundational information in understanding air quality over this region. That being said, there is nothing particularly novel or noteworthy about the study, it is a simple assessment of the region. In addition, it is quite short, so it's difficult to ascertain its potential impact. However, these types of baseline studies are still important in contemporary ecological sciences.

Response: Thanks for your general comments on the paper. In fact, this is really first integrated attempt to monitor the atmospheric concentrations of various reactive N (Nr) species and particulate matter (PM10) in an arid region of Xinjiang, central Asia. We agree your viewpoint — this is a good baseline assessment of air pollution of Nr and particles in arid Xinjiang of China, as an important source region for sand/dust storm worldwide. However, we do not fully agree that there is nothing novel or noteworthy about the study. Our study selected ten monitoring sites along a distinct gradient with different anthropogenic impacts, from the least anthropogenic impacted site (e.g. BKB, only grazing), to medium anthropogenic impact (e.g. BTH, AKS, CLZ, FKZ, farmland sites), and to the strongest anthropogenic impacted sites (e.g. SDS and TFS, urban and suburban sites in Urumqi, the capital city of Xinjiang province). The typical gradient of our monitoring sites has revealed how human activities affect air quality and air chemistry (through gaseous Nr concentrations and ions composition in PM10) and also provided important implications on how to mitigate air pollution of Nr in the arid-oasis region. We agree that the length of our earlier version of the manuscript is relatively short but the length (in particular the section of Discussion) has been improved largely in the revised manuscript.

Specific and Technical Comments: I would like to begin with the caveat that my expertise is in the impacts of excess atmospheric N on ecosystems (aquatic and terrestrial), not on the technical areas of the measurement of atmospheric concentrations. Thus, I rely on others to assess the technical approach in this effort. That being said, there were areas for improvement of the study.

Response: In the revision (section of Introduction), we begin with negative impacts of excess atmospheric reactive N deposition on ecosystems especially in the ecosystems in arid regions. We have also strengthened the importance of the current study and the potential improvement of the study in the future.

I would have like to see more extensive analyses of the results presented, which are numbered here. (1) There is no information as to which differences were significant

and which were not, this could easily be added in a Table. (2) I would like to see greater analyses as to correlations among the different air pollutants, in addition to correlations with environmental factors (i.e. in Figure 6). (3) The regressions in Figure 6 do not confirm to homogeneity of variance assumptions. I would suggest making some transformations to the data, or using a more generalized approach.

Response: Good suggestions. 1) Differences of different reactive nitrogen species across all sites have been added in the Table 2 in the revision; 2) We have analyzed the correlations between different reactive nitrogen species in Table 3 and in the Text (e.g., Lines 144-146); 3) In Fig. 6, you suggest making some transformations to the data, or using a more generalized approach. This is really good. However, we are not sure which kind of data (weather data or air pollutant data?) should be transformed and what kind of a more generalized approach could be used in our study. As a general relationship between air pollutant concentrations and weather conditions, we think the current correlation is fine for the study. We agree that further correlations (strictly based on the homogeneity of variance assumptions) between Nr air pollutants and environmental factors should be conducted in the future.

Figures 3 and 4 are very difficult to read as to render it non-informative. I would suggest trying some other configurations.

Response: Figures 3 and 4 showed the seasonal (spring, summer, autumn and winter) variations of concentrations for different Nr species at ten sites, so we think the two Figs. (which are now merged into one Figure (Fig. 3) in the revision) are informative and important to understand temporal variations of atmospheric Nr concentrations in our study region. We have also revised the captions of the Figure to provide more background information.

Not all farmland is the same, and there should be some elaboration as to the different land uses on the region (if there are any).

Response: More information about all farmland sites has been added in the section of

Monitoring sites.

The discussion is very clear, though I would like to see more information as to how these results are similar to or different from (and why) other studies. It is quite short, so it's difficult to assess the implications of this study.

Response: Agree and revised accordingly. More information has been added so as to explain how our results are similar to or different from other studies as well as the implications of this study to air pollution control in the section of Discussion.

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